

EXHIBIT 22

Robert H. Topel's Reply to
the Supplemental Expert
Report of Hal J. Singer

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UNITED STATES DISTRICT COURT FOR THE DISTRICT OF NEVADA

CUNG LE, et al.,

Plaintiffs,

v.

ZUFFA, LLC d/b/a ULTIMATE
FIGHTING CHAMPIONSHIP and UFC,

Defendants.

Case No. 2:15-cv-01045-RFB-PAL

**Professor Robert H. Topel's Reply to the
Supplemental Expert Report of Hal J. Singer, Ph.D.**

May 7, 2018

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I. INTRODUCTION

1. I am Robert H. Topel, the Isidore Brown and Gladys J. Brown Distinguished Service Professor of Economics at The University of Chicago Booth School of Business. I have been retained by counsel for Zuffa, LLC d/b/a Ultimate Fighting Championship and UFC (collectively, “Zuffa”) to serve as an expert in economics in the above-captioned case. My qualifications were described in my initial report in this matter,¹ and I have attached an updated curriculum vitae as Appendix A to this report.

2. My initial report responded to the August 31, 2017 report filed by Dr. Hal J. Singer on behalf of Plaintiffs in this matter.² I subsequently wrote a sur-rebuttal report,³ which responded to new analyses contained in Dr. Singer’s rebuttal expert report.⁴ Dr. Singer has now offered new analyses in a supplemental expert report that would have been possible to offer in his initial report; among other things, these new analyses modify the impact regression model contained in his initial report by attempting to control for some promoters’ promotional expenses using data that was available to him at the time he wrote his initial report.⁵ I have been asked by counsel for Zuffa to respond to these new impact regressions.

3. My work is ongoing, and I will supplement it if I become aware of new information that affects my conclusions. The materials that I relied on in forming my opinions are listed in Appendix B and are cited throughout my report. The complete details of the calculations that I describe in this report are contained in the computer programs that accompany the report. In

¹ Expert Report of Professor Robert H. Topel, *Cung Le, et al., v. Zuffa, LLC d/b/a Ultimate Fighting Championship and UFC*, Case No. 2:15-cv-01045-RFB-PAL (D. Nev.) (October 27, 2017) [hereinafter TOPEL REPORT] at § I.A. and Appendix B.

² Expert Report of Hal J. Singer, Ph.D., *Cung Le, et al., v. Zuffa, LLC d/b/a Ultimate Fighting Championship and UFC*, Case No. 2:15-cv-01045-RFB-PAL (D. Nev.) (August 31, 2017) [hereinafter SINGER REPORT].

³ Sur-Rebuttal Expert Report of Professor Robert H. Topel, *Cung Le, et al., v. Zuffa, LLC d/b/a Ultimate Fighting Championship and UFC*, Case No. 2:15-cv-01045-RFB-PAL (D. Nev.) (February 12, 2018) [hereinafter TOPEL SUR-REBUTTAL].

⁴ Rebuttal Expert Report of Hal J. Singer, Ph.D., *Cung Le, et al., v. Zuffa, LLC d/b/a Ultimate Fighting Championship and UFC*, Case No. 2:15-cv-01045-RFB-PAL (D. Nev.) (January 12, 2018) [hereinafter SINGER REBUTTAL].

⁵ Supplemental Expert Report of Hal J. Singer, Ph.D., *Cung Le, et al., v. Zuffa, LLC d/b/a Ultimate Fighting Championship and UFC*, Case No. 2:15-cv-01045-RFB-PAL (D. Nev.) (April 3, 2018) [hereinafter SINGER SUPPLEMENTAL] at ¶ 33 and Table A2.

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conjunction with the databases listed in Appendix B, these computer programs can be used to replicate the calculations referenced in my report.

II. DR. SINGER HAS ATTEMPTED TO RESOLVE FLAWS WITH HIS IMPACT REGRESSIONS, BUT HIS NEW REGRESSIONS REMAIN INCOMPLETE

4. My initial and sur-rebuttal reports included a critique of the impact regression prepared by Dr. Singer. For the first time in his supplemental report through the use of a new regression, Dr. Singer attempts to address the critique that Zuffa’s superior business acumen and promotional efforts caused it to grow relative to MMA rivals, attracting a larger share of top MMA athletes and generating greater revenues per event—procompetitive reasons for the patterns in athletes’ wage share and “foreclosure share” we observe. Specifically, Dr. Singer adds two new variables to his impact regression, both relating to certain promotional expenditures made by Zuffa and pre-acquisition Strikeforce as recorded in the companies’ annual financial data. But Dr. Singer’s attempt to remedy his impact regression fails for two fundamental reasons: (1) the data Dr. Singer use, and how he uses them, are incapable of estimating any meaningful effect of Zuffa’s promotional efforts on the compensation outcomes of Zuffa athletes, so it is virtually inevitable that he would not find any relationship between promotional activity and wage share; and (2) the data do not actually measure Zuffa’s or Strikeforce’s promotional efforts and productivity.

5. Dr. Singer claims that he has “calculated Zuffa’s promotional expenditures per bout, and included it as a new control variable in [his] impact regressions,” and that including this variable in his model does not change his impact regression results because “there is no evidence that Zuffa’s promotional activities” affected Zuffa’s athletes’ wage share.⁶ The promotional expenditures in questions are annual totals as recorded in each company’s annual financial data. To obtain a “per-event” number, Dr. Singer divides this annual number by the number of Zuffa events in the relevant year (“I calculated Zuffa’s promotional expenditures per bout”),⁷ and assigns that average to each athlete-event pair for that promoter in that year. Thus, for example,

⁶ SINGER SUPPLEMENTAL at ¶ 33 (citation omitted).

⁷ SINGER SUPPLEMENTAL at ¶ 33 (citation omitted).

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each Zuffa athlete at each Zuffa event in 2009 would be assigned the same value for “Promotional Expenses Per Event.”

6. Were his data left in the form he describes (*i.e.*, “Zuffa’s promotional expenditures per bout”), Dr. Singer’s regression would produce literally nothing: it would not even run. This is because of how regressions work. To estimate a coefficient for a particular variable, say X_l , in a regression, the procedure isolates the variation in X_l that is uncorrelated with (unpredictable from) all the other variables X_2, X_3, \dots, X_k in the regression. It then asks whether this “residual variation” in X_l is correlated with the dependent variable, Y , and calculates an estimated regression coefficient from this correlation. Existence of such “residual variation” in X_l is therefore essential; without it, it is mathematically impossible to estimate a coefficient for the variable X_l .

7. This mathematical fact creates a serious problem for Dr. Singer’s model. Dr. Singer is trying to rebut a hypothesis that, as he puts it, relates to whether “Zuffa’s promotional activities...had any significant effect on Zuffa’s Event Revenue...”⁸ The important word there is “Zuffa”—when *Zuffa* spent more on promotion, did *Zuffa*’s event revenue rise? Dr. Singer’s impact regression model includes a separate indicator variable for each calendar year; *i.e.*, there is an indicator variable that takes the value one for each observation from 2009 and zero for observations in other years, and similarly for other years. Because Zuffa’s “Promotional Expenses Per Event” is the same for every Zuffa observation in a calendar year, it is perfectly correlated with the calendar year indicators—there is no within-year “residual variation” in Zuffa’s promotional expenses per event for the regression to use, and so the model would be incapable of estimating a coefficient representing the putative effect of promotional expenditures on “Event Revenues” or Zuffa’s “wage share.” The statistical software used to estimate the impact regression would “crash” because there is no variation representing the conceptual experiment of raising or lowering Zuffa’s promotional expenditures and asking whether Zuffa’s “wage share” changed as a result.

⁸ SINGER SUPPLEMENTAL at ¶ 33.

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8. Yet Dr. Singer's regression yields estimates that he reports in Table A2 of his supplemental expert report. It did not crash. This means that Dr. Singer has constructed his "Promotional Expenditures Per Event (millions-Zuffa)" variable so that it takes *different values* for MMA events in the same calendar year, despite the fact that Zuffa's average promotional expense per event (as constructed by Dr. Singer) literally cannot vary within a year. Dr. Singer accomplishes this by manufacturing a source of variation that has nothing to do with the question of whether *changes* in Zuffa's promotional efforts generated *changes* in Zuffa's athletes' compensation or event revenue. Instead, at best, his promotional expenditures variable asks whether the level of Zuffa's expenditures are associated with a larger or smaller gap *between* the wage shares of Zuffa and Strikeforce.

9. Specifically, Dr. Singer assigns a value for Zuffa's promotional expenditures to *both* Zuffa and Strikeforce events in the three years before Strikeforce was acquired (*i.e.*, 2008 to 2010). Let $Z_{E,t}$ denote his measure of "Zuffa Promotional Expenses per Event" for event E in year t . For Zuffa events, he assigns each event the average per-event value of Zuffa promotional expenditures in that year. For Strikeforce events, he arbitrarily assigns a Zuffa promotional value of zero, as if Zuffa expenditures affected Strikeforce outcomes, thereby repeating the same error that I described in my sur-rebuttal report in the context of his "foreclosure share" variable.⁹ For example, in 2009 Zuffa's average promotional expenditures per event were \$747 thousand, so Zuffa events in 2009 were assigned a value of \$747 thousand and all Strikeforce events in 2009 were assigned a Zuffa promotional expenditure of \$0. The conceptual question then "answered" by Dr. Singer's revised impact regression is whether events in 2009 with higher values of $Z_{E,t}$ (*i.e.*, Zuffa events with a value of \$747 thousand) had lower wage shares than events with lower values of $Z_{E,t}$ (*i.e.*, Strikeforce events with a value of \$0). This difference in wage shares is between Zuffa and Strikeforce events, not between Zuffa events with different promotional expenditures. Thus, the resulting "estimate" Dr. Singer obtains has nothing to do with the question of whether *changes* in Zuffa's promotional efforts *changed* compensation or event revenue in Zuffa events. His regression is wholly incapable of answering the question he posed.

⁹ TOPEL SUR-REBUTTAL at ¶ 24.

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10. In fact things are worse than this. In addition to his incorrect measure of Zuffa's promotional expenditures per event, Dr. Singer also created a conceptually identical variable for Strikeforce promotional expenditures per event; call it $SE_{E,t}$. Mirroring his construction of $ZE_{E,t}$, this variable is arbitrarily assigned a value of zero for each Zuffa event in a calendar year, and for each Strikeforce event he assigns $SE_{E,t}$ a value equal to Strikeforce's average promotional expenditures per event in year t . He then includes both $ZE_{E,t}$ and $SE_{E,t}$ in his regression. But these variables are almost perfectly collinear. If $ZE_{E,t}$ is positive then the event in question must be a Zuffa event, and $SE_{E,t}$ is zero. And if $SE_{E,t}$ is positive it must be a Strikeforce event so that $ZE_{E,t}$ is zero. (The correlation between them is -0.97.) One can almost perfectly predict S from Z , or Z from S , which means that there is no meaningful "residual variation" that allows one to estimate the effects of these variables, even if the variables made sense, which they do not.

11. Finally, it is worth emphasizing that all of Dr. Singer's "evidence" on the effects of Zuffa's promotional expenses is generated by the presence of pre-acquisition Strikeforce events in the years from 2008 to 2010. His calculated values of Zuffa's promotional expenditures during the class period contribute nothing because, as explained above, even his incorrect measure of Zuffa's "Promotional Expenses per Event" has no within-year variation for those years. Without those Strikeforce observations his model will not even run.

12. These flaws in Dr. Singer's new impact regression are fatal—one cannot learn anything useful from what he has done, and he has certainly not shown that Zuffa's investments and superior business acumen are not important determinants of athletes' wage share. Even ignoring these facts, Dr. Singer's analysis is incomplete even if taken on his own terms. Dr. Singer claims to control for Zuffa's non-athlete event-level promotional expenditures, but Dr. Singer only controls for an accounting measure of promotional expenditures, which is only a portion of Zuffa's event-level investments and expenditures. He fails to control for or take into account other relevant event-level Zuffa expenditures which, as I show below, have a significant impact on the share of event revenues paid to athletes (*i.e.*, the dependent variable in Dr. Singer's regression). When relevant Zuffa's event-level expenditures are properly taken into account (even when using Dr. Singer's fundamentally flawed specification of wage share as a dependent variable), the "impact" coefficient on Dr. Singer's foreclosure share is statistically insignificant.

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13. In addition to these shortcomings, Dr. Singer's new regression cannot account for Zuffa's superior productivity in promoting and expanding its own events and MMA generally. This key point is distinguished from Dr. Singer's flawed empirical exercise because it focuses on Zuffa's superior business acumen and *productivity* in promoting MMA events, rather than Zuffa's *expenditures* on promoting those events.

A. DR. SINGER'S MEASURE OF PROMOTIONAL EXPENDITURES REPRESENT A MINORITY OF ZUFFA'S INVESTMENTS

14. As discussed above, Dr. Singer changes his impact regression by adding two additional variables relating to certain promotional expenditures made by Zuffa and Strikeforce (before Strikeforce was acquired by Zuffa). These promotional expenditures are calculated using Zuffa's and Strikeforce's annual profit and loss financial statements.¹⁰ For each year between 2005 and 2016, Dr. Singer uses these statements to calculate Zuffa's and Strikeforce's annual expenditures on promotional investments, including expenses related to "Branding," "PPV Advertising," "Event Promos," "Digital Marketing," or "Other Ad Broadcast Costs."¹¹ Dr. Singer then divides these annual expenses by the number of events Zuffa or Strikeforce held in the year, and assigns the resulting quotient to each Zuffa or Strikeforce bout in the year. So, for example, according to Dr. Singer's calculations, Zuffa spent \$31 million on promotion and held 32 events in 2010. Zuffa's promotional expenditures per event were then \$31 million divided by 32 events, or \$970 thousand.¹² Importantly, Dr. Singer assigns this average promotional expenditure per event to all Zuffa events in 2010, irrespective of whether the event was a marquee UFC pay-per-view event or a smaller event promoted under the World Extreme Cagefighting ("WEC") banner. In addition, this averaging continues throughout his analysis and, for example, in 2016, he assigns the same average promotional expenditure of \$1.1 million to all Zuffa events in 2016, irrespective of whether that event was a marquee UFC pay-per-view event, *e.g.* UFC 200 for which Zuffa spent \$12.8 million (excluding athlete compensation) on July 9, 2016, or an event

¹⁰ SINGER SUPPLEMENTAL at ¶ 33 and n. 97.

¹¹ SINGER SUPPLEMENTAL at ¶ 33 and n. 97.

¹² SINGER BACKUP.

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broadcast over Zuffa's "Fight Pass" internet streaming service, *e.g.* UFC Fight Night event held on July 7, 2016 for which Zuffa spent \$1.6 million (excluding athlete compensation).¹³

15. Dr. Singer's revised impact regressions (improperly) attempt to control for only one of many relevant categories of investments that Zuffa makes to improve the quality of its events: promotional expenditures. The expenditures identified by Dr. Singer represent a small fraction of Zuffa's overall investments in producing and promoting MMA events. For example, Dr. Singer's revised impact regression does not control for the production costs (*e.g.*, set design and construction costs, video production costs, and equipment costs) associated with staging an event and creating a high-quality, competitive product—all of which may impact event revenues and so Dr. Singer's "wage share." So even if Dr. Singer had properly accounted for promotional expenditures in his new impact regression—and he has not—his regression would still fail to account for the majority of Zuffa's expenditures.

16. To illustrate the importance of these investments made by Zuffa to Dr. Singer's impact regression, I reviewed the annual Zuffa profit and loss financial statements that Dr. Singer relied on and I categorized expenses in four ways: (1) promotional costs, (2) event production costs, (3) athlete compensation, and (4) other event costs. Exhibit 1 shows the annual average levels of promotional costs, event production costs, and other event costs for Zuffa events between 2008 and 2016.¹⁴ Without addressing the question of whether Zuffa's productivity in promoting MMA events increased over this period, two things are apparent in reviewing the exhibit.

17. First, Zuffa's production expenses and other event investments increased between 2008 and 2016. In 2008, Zuffa's average production expenses were approximately \$1.8 million per event, while in more recent years these expenses have typically exceeded \$2.2 million per event.¹⁵ Similarly, in 2008, Zuffa's other event expenses were approximately \$695 thousand per event, while in more recent years these expenses have typically exceeded \$1 million per event.

¹³ SINGER BACKUP.

¹⁴ Exhibit 1 also reports Dr. Singer's per event measures of promotional expenses for Zuffa. My promotional expenses are lower than his because Dr. Singer includes non-event related promotional expenses, while I exclude these expenses.

¹⁵ The costs in Exhibit 1 are in expressed in 2016 dollars. I deflate using the CPI-U.

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18. Second, Zuffa's promotional costs are lower than its production costs and other event costs. Between 2008 and 2016, Zuffa's promotional costs represented at most 28 percent of its total event costs excluding athlete compensation. Over the same period, Zuffa's production costs represented between 38 and 58 percent of Zuffa's total event costs excluding athlete compensation. In short, even if Dr. Singer's revised impact regressions had properly controlled for Zuffa's promotional expenditures, these regressions would still have excluded the majority of the pro-competitive investments that Zuffa made in its events.

19. I also note that, even adopting Dr. Singer's incomplete and improper promotional costs variable in his flawed impact regression model, the inclusion of his measure of promotion costs has substantial effects on the estimated coefficient on Dr. Singer's foreclosure share variable. In his revised impact regression reported in Table A2 of his Supplemental report, his estimated "impact" of "foreclosure share" in his Ranked input market is weaker (*i.e.*, the coefficient on "foreclosure share" for his Ranked input market is closer to zero in magnitude).¹⁶ This is important because Dr. Singer uses the results of his impact regression for the Ranked input market to calculate aggregate damages to the putative class.¹⁷ Although Dr. Singer does not recalculate aggregate damages using his revised impact regression, when I adopt Dr. Singer's damages methodology but use the estimates from his revised impact regression, I find that his estimated damages decrease using the Strikeforce benchmark by 46 percent from \$1,598 million to \$856 million (a decrease of \$742 million).¹⁸

B. AFTER CONTROLLING FOR EVENT COSTS, THERE IS NO CORRELATION BETWEEN ATHLETES' WAGE SHARES AND "FORECLOSURE SHARE"

20. As explained above, Dr. Singer's measures of promotional expenditures per event have no independent variation across Zuffa's events within a year, so they are incapable of having any meaningful effect on Dr. Singer's impact regression. But measures of Zuffa's costs are available at the event level, which provides independent variation across events in each calendar year. I

¹⁶ Compare SINGER REPORT, Table 6 with SINGER SUPPLEMENTAL, Table A2.

¹⁷ SINGER REPORT at §§ VI.B and VI.C.

¹⁸ SINGER REPORT, Table 11.

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have re-estimated Dr. Singer's revised impact regression using event-level data on Zuffa's costs (excluding athlete compensation) that Dr. Singer included in the database that he used in his initial report to estimate his impact regression. This measure of costs is defined at the event level and includes all event costs besides athlete compensation, including promotional costs, production costs, and other event costs.¹⁹

21. **Dr. Singer's new impact regression:** For ease of comparison, columns 1-3 of Exhibit 2 show the results of Dr. Singer's original flawed impact regression using his measures of "foreclosure share" for each of the Tracked, Ranked, and Headliner input markets.

22. In columns 7-9, I add to the regression the logarithm of event costs excluding athletes' compensation.²⁰ In contrast to Dr. Singer's impact regression in his initial report and the revised results in his supplemental report (which controls for annual average promotional costs), for each of Dr. Singer's Tracked, Ranked, and Headliner input markets, the coefficient on the "foreclosure share" is statistically insignificant. The coefficients on the logarithm of event costs excluding athlete compensation are negative and highly statistically significant. That is, after controlling for event-level non-athlete compensation costs, Dr. Singer's impact regression provides no evidence that athletes' wage share decreased as the number of athletes under contract with Zuffa ("foreclosure share") increased.

23. **The effect of missing data on Dr. Singer's new impact regression:** In controlling for event-level costs in this manner, I use cost information as compiled by Dr. Singer in his impact regression database. However, Dr. Singer's database is missing event-level cost data for 87 pre-acquisition Strikeforce observations. The missing cost data for these observations causes the observations to be excluded from the impact regression in the specifications that control for event-level costs (*i.e.*, columns 7-9 of Exhibit 2). As a result, there are two sources of the

¹⁹ SINGER BACKUP. Dr. Singer compiled the information necessary to calculate event-level costs from event-level profit and loss financial statements from Strikeforce and Zuffa. I calculate total event costs unrelated to athlete compensation as total event costs minus total athlete compensation at each event. These variables are labeled *event_totalcosts* and *event_fighter_total_comp* in Dr. Singer's file *Regression Data.dta*, which was the data file Dr. Singer used to run the regressions included in his initial report.

²⁰ In this modified impact regression, my use of the logarithm of event costs implies that a percentage change in event costs (excluding athlete compensation) leads to a constant percentage point change in athletes' wage share (holding the other determinants of wage share in the regression model constant).

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observed difference between the results in columns 1-3 and 7-9 of Exhibit 2. First, columns 7-9 control for event-level total costs. Second, columns 7-9 exclude 87 pre-acquisition Strikeforce bouts that are included in columns 1-3. To disentangle the effects of these two changes, columns 4-6 show Dr. Singer's original impact regression estimated after excluding the 87 pre-acquisition Strikeforce bouts with missing event-level cost data. Simply by excluding these 87 bouts, in the Tracked, Ranked, and Headliner input markets the magnitude of the coefficient on "foreclosure share" gets appreciably smaller, and is statistically insignificant at the 5 percent and 1 percent levels of statistical significance.²¹ While I have previously explained that it is *not* appropriate to include any of the pre-acquisition Strikeforce bouts from Dr. Singer's impact regression,²² the fragility of Dr. Singer's findings underscore my opinion that Dr. Singer has provided no statistically reliable or relevant evidence that Zuffa suppressed MMA athletes' compensation below competitive levels.

C. DR. SINGER'S REVISED IMPACT REGRESSIONS IGNORE EVENT-LEVEL VARIATION IN PROMOTIONAL EXPENDITURES

24. Dr. Singer is incorrect to argue that there is no evidence that "Zuffa's promotional activities have increased the revenue-generating ability of non-Fighter inputs relative to Fighters" because "the coefficient on Zuffa's promotional expenditures is statistically indistinguishable from zero in all specifications."²³ As I explained above, the coefficient on promotional expenditures is statistically indistinguishable from zero in Dr. Singer's revised impact regression because he has designed the regression and constructed his data in such a way that makes it nearly impossible that he could have obtained any other result.

25. While Dr. Singer claims to control for Zuffa's "promotional expenditures per bout" in his impact regression model,²⁴ he does not, in fact, control for variation in Zuffa's and Strikeforce's promotional expenditures at the bout (or event) level. Rather, he assigns each Zuffa or

²¹ See Exhibit 3. The p-values for the "foreclosure share" coefficient in the Tracked, Ranked, and Headliner markets are 0.233, 0.086, and 0.250. See also Federal Judicial Center, *Reference Manual on Scientific Evidence* (3d ed. 2011) at 251-52 ("In practice, statistical analysts typically use levels of 5% and 1%."). This is equivalent to using p-values of 0.05 and 0.01.

²² TOPEL REPORT at § VII.B; TOPEL SUR-REBUTTAL at § II.C. See also TOPEL SUR-REBUTTAL at n. 25.

²³ SINGER SUPPLEMENTAL at ¶ 29.

²⁴ SINGER SUPPLEMENTAL at ¶ 33.

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Strikeforce event in the same year the same value for promotional expenditures. For example, Dr. Singer's impact regression includes bouts from 26 Zuffa events in 2009 and 32 Zuffa events in 2010. In his new impact regression, he associates each bout in 2009 with a promotional expenditure of \$747 thousand and each bout in 2010 with a promotional expenditure of \$967 thousand.

26. As an example of the event-level variation that Dr. Singer ignores in his new impact regression, Exhibits 3 and 4 show total revenues and total costs (minus athlete compensation) for each of the events that Zuffa held in 2009 and 2010.²⁵ As is clear from the exhibits, there is substantial variation across Zuffa's events in these two years both in terms of revenue and costs. There is also a clear positive correlation between the two: when Zuffa's costs net of athlete compensation are high, so are revenues. So, for example, Zuffa's first event of 2010, UFC 108, had total event cost net of athlete compensation of \$2.3 million and total event revenue of \$13.7 million. However, in Zuffa's next event in 2010, WEC 46 (held only eight days later), total event cost net of athlete compensation and event revenue were \$1 million and \$1.7 million. While these events are clearly different in terms of Zuffa's investments and Zuffa's return, Dr. Singer assigns both the same value of "promotional expenditures" in his revised impact regression. As I explained earlier, Dr. Singer's measure of Zuffa's "Promotional Expenses Per Event" does not vary across Zuffa events within a year, so his concocted variable cannot estimate an effect of between-event changes in Zuffa's investments or costs on Zuffa's "wage share" or on anything else.

27. This defect is compounded because Dr. Singer is apparently missing Strikeforce financial statements for 2008. To address the problem, he simply assumes that annual average Strikeforce promotional expenditures per event were identical in 2008 and 2009, thereby making it appear (in the context of his impact regression) that there is less variation in promotional expenditures than there likely actually was. Along with Dr. Singer's other errors in specifying his impact regression, the masking of year-to-year variation in promotional expenditures decreases the

²⁵ Dr. Singer collects these data from Zuffa's event-level profit and loss financial statements. The cost information in these financial statements reflect all Zuffa's investments that are specific to each event. For example, they include many of the promotional expenditures that Dr. Singer includes in his new impact regression model, as well as other forms of investment that affect Zuffa's revenues (*e.g.*, production expenses) that Dr. Singer chooses not to include.

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likelihood that he would find a statistically significant effect of promotional expenditures on wage shares in his impact regression. But Dr. Singer has no basis for the assumption that promotional expenditures between those two years are the same.

28. I explained above that Dr. Singer manufactures within-year variation in his measure of Zuffa's promotional expenses per event by arbitrarily assigning values of zero to *Strikeforce* events, and that the resulting variation has nothing to do with the effects of Zuffa's promotional expenses on Zuffa's revenue or compensation outcomes. Put differently, Dr. Singer's revised impact regression is not estimable if I exclude the 212 pre-acquisition Strikeforce bouts because without the pre-acquisition Strikeforce bouts, there is no within-year variation in Dr. Singer's promotional expenditure variable for Zuffa: in every year, it takes the same value for each observation, and so is subsumed in the year fixed effects he includes in his model. To be clear, this does not mean that Dr. Singer's fixed effects properly controlled for Zuffa's promotional expenditures on event revenues; rather it means that Dr. Singer chose to avoid readily available event-level data and instead manipulated the data on Zuffa's promotional expenditures in a way that allowed his foreclosure share variable to appear to remain significant. It is worth repeating that his promotional expense variables measure no meaningful concept, and so they are incapable of identifying any meaningful effect.

D. DR. SINGER'S OTHER CONTROLS FOR PROMOTIONAL EXPENDITURES ARE INADEQUATE AND INCOMPLETE

29. In his supplemental report, Dr. Singer argues that including Zuffa and pre-acquisition Strikeforce promotional expenditures in his regression is unnecessary because his regression already includes a time trend (which is the same for both Zuffa and Strikeforce), year fixed effects, and promoter fixed effects.²⁶ So, for example, Dr. Singer argues that the inclusion of a time trend in his impact regression "controls for the possibility that Zuffa's non-Fighter inputs (such as Zuffa's promotional acumen) have somehow contributed more over time to Event Revenue than Fighters, therefore allowing Zuffa to pay them a lower wage share."²⁷

²⁶ SINGER SUPPLEMENTAL at ¶¶ 29-31.

²⁷ SINGER SUPPLEMENTAL at ¶ 29.

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30. Putting aside all the other shortcomings of Dr. Singer's impact regression, Dr. Singer's argument would be correct only under very narrow and implausible circumstances. Specifically, the linear time trend would accomplish what Dr. Singer argues it does only if (i) Zuffa's promotional acumen (or other procompetitive investments) affected Zuffa's athletes' wage share at a constantly increasing rate between 2005 and 2016, and (ii) Strikeforce's promotional acumen (or other procompetitive investments) affected Strikeforce's athletes wage share at the *same* constant rate between 2008 and 2010. So, for example, the second of these assumptions implausibly implies that the increasing success Zuffa enjoyed in promoting MMA events between 2008 and 2010 was also enjoyed by Strikeforce, which was a small MMA promoter whose owners were seeking to exit the business.²⁸

31. In a similar manner, Dr. Singer's year fixed effects control for average differences (that are the same across all promoters) in promoters' procompetitive investments across years, while his promoter fixed effects control for average differences (that are the same across all years) between UFC, Strikeforce, and the WEC in the procompetitive investments they make in their respective events. But, for example, the year fixed effects do not allow for variation in Zuffa's procompetitive investments across Zuffa events held in the same year, and the promoter fixed effects do not allow for variation in Zuffa's procompetitive investments across UFC events between 2005 and 2016.

32. To demonstrate the inadequacy of this approach, Exhibit 5 provides information on the revenue, athlete compensation, and total costs net of athlete compensation for a selection of Zuffa events in 2010 and 2016. In the first UFC Live event, Zuffa's total event cost net of athlete compensation was \$1.2 million, and event revenue was \$3.0 million. In the next event, UFC 111, held six days later, Zuffa's total event cost net of athlete compensation and revenue were substantially higher at \$6.0 million and \$28.1 million, respectively. Four days later at a third UFC event, Zuffa's total event cost net of athlete compensation costs and revenue decreased to \$1.2 million and \$3.1 million. If the variation in revenue across these three events is, in part, related to the Zuffa's procompetitive investments, then Dr. Singer's linear time trend, year fixed effects, and promoter fixed effects cannot account for this. There is no linear trend in revenue,

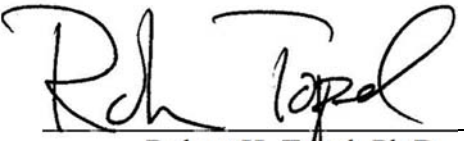
²⁸ TOPEL REPORT, § IX.A.

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and Dr. Singer's year and promoter fixed effects are incapable of distinguishing between these three events. However, there is substantial variation in the fraction of Zuffa's event revenues that are paid to athletes. In the first and third events, when Zuffa's costs were low, athletes were paid 33 percent and 23 percent of event revenues. When Zuffa's costs were substantially higher in the second event, athletes were paid 13 percent of event revenues. We see similar relationships among costs, revenues and athlete wage shares for the two 2016 Zuffa events in Exhibit 5.

III. CONCLUSION

33. This report contains a statement of my opinions regarding the revised impact regression offered by Dr. Singer in his supplemental report. While I confine my discussion in this report to Dr. Singer's revised impact regression, I do not concede the correctness of the remaining opinions that Dr. Singer offered in his supplemental report. Rather, Dr. Singer's supplemental report has not altered any of the opinions that I expressed in my earlier reports.



Robert H. Topel, Ph.D.
May 7, 2018

APPENDIX A: CURRICULUM VITAE

Robert H. Topel

CURRICULUM VITAE

April 2018

CURRENT POSITIONS

Isidore Brown and Gladys J. Brown Distinguished Service Professor of Economics,
Booth School of Business, The University of Chicago
Director, George J. Stigler Center for the Study of the Economy and the State
Co-Director, Energy Policy Institute at Chicago (EPIC)
Research Associate, National Bureau of Economic Research

EDUCATION

B.A. (with High Honors), University of California, Santa Barbara, 1974
Ph.D., University of California, Los Angeles, 1980

FIELDS OF SPECIALIZATION

Microeconomics, Labor Economics, Industrial Organization, Health Economics,
Economic Policy, Energy Economics, National Security Economics

PREVIOUS ACADEMIC POSITIONS

Professor of Economics, Graduate School of Business, University of Chicago, 1986-93
Kirby Distinguished Visiting Professor of Economics, Texas A&M University, 2006
Professor of Economics, Department of Economics, University of California, Los Angeles, 1986
Associate Professor of Economics, Department of Economics, University of California, Los Angeles, 1985-86
Associate Professor of Economics, Graduate School of Business, University of Chicago, 1983-85
Assistant Professor of Economics, Department of Economics, University of Chicago, 1980-83

OTHER AFFILIATIONS

Research Associate, National Bureau of Economic Research, 1984-present
Senior Fellow, the Milken Institute, 1999-present
Faculty Member, MacLean Center for Clinical Medical Ethics, The University of Chicago
Member, National Petroleum Council Taskforce on Transportation Fuels Supply and Infrastructure, 2010-2012
Fellow, Center for the Study of Poverty and Inequality, Stanford University, 2006-present

Member, Brookings Panel on Economic Activity, various years
Visiting Scholar, Board of Governors of the Federal Reserve, 1990
Research Associate, Economics Research Center, NORC, 1980—1990
Consulting Economist, The Rand Corporation, 1982—1989
Research Associate, Center for the Study of the Economy and the State, 1980—present
Faculty Research Fellow, National Bureau of Economic Research, 1981-83
Research Economist, Unicon Corporation, 1981-88
Consultant, U.S. Department of Labor, 1985-90
Partner, Chicago Partners LLC 1994-2008
Principal & Managing Director, Navigant Economics, 2008-2013
Board of Directors, Ingalls Hospitals and Ingalls Health Service, 2000-2012
Director, WGA Evans Scholars Foundation, 2011-present
Senior Consultant, Charles River Associates, 2013-present

EDITORIAL POSITIONS

Editor, *Journal of Political Economy*, 1993-2003
Board of Editors, *American Economic Review*, 1992-94
Associate Editor, *Journal of Labor Economics*, 1982-92
Editorial Board, *International Journal of the Economics of Business*, 1993-present
Member of the Advisory Board, ERN Labor Journals, 1998-present

HONORS & AWARDS

Kenneth J. Arrow Award, International Health Economics Association, 2007
Kirby Distinguished Visiting Professor, Texas A&M University, 2006
Research America Eugene Garfield Prize for Medical and Health Research, 2005
Elected Fellow, Society of Labor Economists, 2004
Elected Member, Conference on Research in Income and Wealth
Elected Founding Member, National Academy of Social Insurance
William Ladany Research Scholar, The University of Chicago, 1989-91
William Fishman Research Scholar, The University of Chicago, 1986-87
Smith Richardson Dissertation Fellowship in Political Economy, 1978-79
Foundation for Research in Economics and Education Fellowships, 1975-79
Chancellor's Intern Fellow, University of California, Los Angeles, 1975-79
University Fellow, Northwestern University, 1975
General Electric Dissertation Fellowship, 1978

TEACHING EXPERIENCE

Graduate Economic Theory I, II, III
Law, Economics and Business
Competitive Strategy
Advanced Topics in Labor Economics
Advanced Topics in Microeconomics
Managing the Workplace
Industrial Organization/Antitrust
Price Theory

OTHER PROFESSIONAL ACTIVITIES

Thompson Lecture (Keynote Address), Midwest Economic Association, 2000
Nominating Committee, American Economic Association, 1996, 1997
Program Committee, American Economic Association, 2006-2007
Organizer, Universities-NBER Research Conference: "Labor Markets in the 1990s," Cambridge, December 1989
Program Chair, Labor Economics, Econometric Society Meetings, December 1989
National Science Foundation Review Panel in Economics, 1998, 1999
Inaugural Keynote Lecture, Missouri Economics Conference, University of Missouri, 2001
Pihl Lecturer, Wayne State University, November, 2004
Keynote Address, Federal Reserve Bank of Cleveland Conference on Education and Economic Development, November, 2004
Kirby Lecturer, Texas A&M University, 2006
Huggins Lecturer, Department of Surgery Huggins Conference, The University of Chicago, May, 2007
Keynote Address, Conference Board of Canada Conference on Medical Research, Montreal, January 2009
Keynote Address, Council on Competitiveness Conference on Energy Policy, Argonne National Laboratory, May 2009
Keynote Address, The University of Chicago/RFF/University of Illinois Conference on *Energy Policy and the Economy*, Washington, D.C., January 2010
Keynote Address, Humana Health Economics Forum, Santa Fe Institute, 2011
Keynote Address, Toyota Sustainability Conference, La Jolla, 2011
Keynote Address, Conference on Health Policy, Arizona State University, 2013

UNIVERSITY SERVICE

Director, Undergraduate Program in Economics, 1980-83
Chairman, Graduate School of Business Curriculum Review, 1990-91
Committee on Graduate Education, 1992-94
Committee on Undergraduate Education, 1993-94
Council of the University Senate, 1992-94, 1995-97, 1999-2002, 2004-07, 2010-13
Committee of the Council of the University Senate, 2000-02, 2006-07
Chairman, Council of the University Senate Committee to Review and Interpret the University Statutes, 2012-13
Graduate School of Business Policy Committee, 1995-97, 1999-2001
Member, Presidential Search Committee, 1999-2000
Board of Directors, The University of Chicago Laboratory Schools, 1986-92, 1998-2007
Chairman, Director Search Committee, The University of Chicago Laboratory Schools, 2002-2003
Area Coordinator, PhD Program in Economics, 2002-2008
Director, George J. Stigler Center, 2007-2015
Director, The University of Chicago Energy Initiative, 2008-2010
Co-Director, Energy Policy Institute at Chicago, 2010-present

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Books:

The Welfare State in Transition, with Richard Freeman and Birgitta Swedenborg. Chicago: The University of Chicago Press for NBER, 1997.

Labor Market Data and Measurement, with John Haltiwanger and Marilyn Manser. Chicago: The University of Chicago Press for NBER, 1998.

Välfärdsstat i omvandling: Amerikanskt Perspektiv på den Svenska Modelten, with Richard Freeman and Birgitta Swedenborg. Författarna och SNS Förlag, 1995.

Measuring the Gains from Medical Research: An Economic Approach, with Kevin M. Murphy. Chicago: The University of Chicago Press (2003).

Reforming the Welfare State: Recovery and Beyond in Sweden, with Richard Freeman and Birgitta Swedenborg, Chicago, The University of Chicago Press for NBER, 2009.

Att Reformera Välfärdsstaten, with Richard Freeman and Birgitta Swedenborg, SNS Förlag, Stockholm, 2006.

Distributional Aspects of Energy and Climate Policy, ed. with Mark Cohen and Don Fullerton, Special Issue of the BE Journal of Economic Analysis and Policy, Spring 2011. Also, Edward Elgar Publishing, Surrey, UK, 2013.

Articles and Monographs:

“Layoffs, Inventories, and the Demand for Labor,” Ph.D. Dissertation, University of California, Los Angeles, December 1980.

“Unemployment Insurance: Survey and Extensions” (with F. Welch), *Economica* **47** (August 1980): 351-79.

“Inventory Adjustments, Industry Behavior, and the Business Cycle” (with A. Stockman), presented at the NBER Conference on Inventories and Business Cycles, March 1980.

“Inventories, Layoffs, and the Short-Run Demand for Labor,” *American Economic Review* (September 1982): 769-87.

“Experience Rating of Unemployment Insurance and the Incidence of Unemployment,” *Journal of Law and Economics* (April 1984): 61-90.

“On Layoffs and Unemployment Insurance,” *American Economic Review* (September 1983): 541-59.

“Equilibrium Earnings, Turnover, and Unemployment: New Evidence,” *Journal of Labor Economics* (October 1984): 500-22.

“Local Labor Markets,” Presented at Hoover Institution Conference on Labor Markets, January 1983. *Journal of Political Economy* **94** (June 1986, part 2): 111-43.

“Estimation and Inference in ‘Two-Step’ Econometric Models” (with K. M. Murphy), *Journal of Business and Economic Statistics* **3** (October 1985): 370-80.

“Employment Risk, Sectoral Shifts, and Unemployment,” (with G. Neumann), in *Studies in Search*, ed. N. M. Kiefer and G. R. Neumann. Oxford: Oxford University Press, 1989.

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“Unemployment, Risk and Earnings: Theory and Evidence from a Model of Equalizing Wage Differentials” (with K. M. Murphy), in *Unemployment and the Structure of Labor Markets*, ed. J. Leonard and K. Lang. London: Basil Blackwell, 1986, pp. 103-140.

“Job Mobility, Search, and Earnings Growth: A Reinterpretation of Human Capital Earnings Functions,” *Research in Labor Economics* **8** (1986): 199-233. Reprinted in *Research in Labor Economics 35th Anniversary Retrospective, 2012*, 401-435.

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“Reforming the Welfare State: Recovery and Beyond in Sweden” (with Richard Freeman and Birgitta Swedenborg), in *Recovery and Beyond: Reforming the Welfare State in Sweden*, Richard Freeman, Birgitta Swedenborg and Robert Topel, eds., The University of Chicago Press for NBER, 2009.

“On the Economics of Climate Policy” (with Gary S. Becker and Kevin M. Murphy), *BE Journal of Economic Analysis and Policy*, April 2011.

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“Some Basic Economics of National Security” (with Kevin M. Murphy), *American Economic Review*, May 2013.

“Competitive Discounts and Antitrust Policy” (with Kevin. M. Murphy and Edward A. Snyder), *Oxford Handbook of Antitrust Economics*, 2015.

“Human Capital Investment, Inequality and Economic Growth” (with K. M. Murphy), *Journal of Labor Economics*, Volume 34, No. S2, Part 2, April 2016, 99-127

“Estimating the Social Value of a Prospective New Good: The Case of Hydrogen Fuel Cell Electric Vehicles”, *Proceedings of the Physics of Sustainable Energy IV (PSE-IV)*, Pushpalatha C. Bhat, George W. Crabtree & Robert H. Knapp Jr. (eds.), April 2017

Selected Congressional Testimony and Presentations:

“Unemployment and Insurance,” Testimony before the U.S. Senate Committee on Finance, April 23, 1991.

“The Economic Value of Medical Research,” Testimony before the U.S. Senate Committee on Health, Education, Labor, and Pensions, May 10, 2001.

“The Value of Improvements in Health and Longevity,” Presentation for Congressional Staff and the American Cancer Society, Washington, July, 2005.

Selected Reports:

“Unemployment Insurance Financing and Unemployment: Empirical Investigation of Adverse Incentives,” Final Report, U.S. Department of Labor Contract No. B9M22046, November 1982.

“Unemployment and Unemployment Insurance,” Final Report, U.S. Department of Labor, ETA, May 1984.

“Local Labor Markets,” Final Report, U.S. Department of Labor, Office of the Assistant Secretary for Policy, March 1984.

“The Use of Survey Data in Predicting Behavior: The Case of Enlistment Intentions,” Final Report, U.S. Department of Defense, May 1985.

“Equalizing Wage Differences,” Final Report, U.S. Department of Labor, Office of the Assistant Secretary for Policy, August 1985.

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Book Reviews:

Employment Hazards by W. Kip Viscusi. In *Journal of Economic Literature*, March 1982.

Handbook of Labor Economics, ed. O. Ashenfelter and R. Layard. In *Journal of Economic Literature*, 1988.

Selected Comments:

“Comment on ‘Some Recent Developments in Labor Economics and Their Implications for Macroeconomics’,” *Journal of Money, Credit and Banking* **20** (August 1988, part 2).

“Comment on ‘Industry Rents: Evidence and Implications’,” (by Lawrence Summers and Lawrence Katz) *Brookings Papers on Economic Activity*, Brookings Institution, Washington, D.C., 1989.

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“Comment on ‘Why Is the U.S. Unemployment Rate So Much Lower?’” *NBER Macroeconomics Annual*, 1998, pp. 67-72.

“Comment on ‘Does Immigration Grease the Wheels of the Labor Market?’” by George J. Borjas. *Brookings Papers on Economic Activity*,, edited by William C. Brainard and George L. Perry. Washington, D.C. Brookings Institution, 2001.

“Comment on ‘Where did the Productivity Growth Go? Inflation Dynamics and the Distribution of Income’” by Ian Dew-Becker and Robert J. Gordon. *Brookings Papers on Economic Activity*. edited by William C. Brainard and George L. Perry. Washington, D.C. Brookings Institution, 2005, 135-44.

Recent Cases, Reports and Testimony

In Re Text Messaging Antitrust Litigation in the United States District Court for the Northern District of Illinois Eastern Division, No. 8 C 7082-MDL No. 1997. Expert on behalf of AT&T, Sprint, T-Mobile, Verizon Wireless and CTIA. Expert Report, July 3, 2013. Supplemental Expert Report, July 15, 2013.

The Apple iPod iTunes Antitrust Litigation in the United States District Court for the Northern District of California Oakland Division, No. C 05 00037 YRG, C 06 04457 YRG. Expert on behalf of Apple in iPod antitrust class action. Expert Report, July 19, 2013.

In Re Text Messaging Antitrust Litigation in the United States District Court for the Northern District of Illinois Eastern Division, No. 8 C 7082-MDL No. 1997. Expert on behalf of AT&T, Sprint, T-Mobile, Verizon Wireless and CTIA. Deposition, September 16, 2013.

The Education Management Corp. Shareholder Derivative Action in the Court of Common Pleas of Allegheny County, Pennsylvania, Civil Division, No. GD-12-008785. Expert on behalf of Education Management Corp. in a Fraudulent Job Placement Claim and Incentive-Based Compensation Claim. Expert Report, October 14, 2013.

The J.B. Hunt Transport, Inc. Wage and Hour Litigation in the United States District Court for the Central District of California Western Division, No. 2:07-cv-08336-MWF-FMOx. Expert on behalf of J.B. Hunt Transport, Inc. in California Dedicated Contract Services and Intermodal Services drivers' class action. Declaration and Expert Report, October 17, 2013.

The Apple iPod iTunes Antitrust Litigation in the United States District Court for the Northern District of California Oakland Division, No. C 05 00037 YRG, C 06 04457 YRG. Expert on behalf of Apple in iPod antitrust class action. Deposition, November 8, 2013.

The J.B. Hunt Transport, Inc. Wage and Hour Litigation in the United States District Court for the Central District of California Western Division, No. 2:07-cv-08336-MWF-FMOx. Expert on behalf of J.B. Hunt Transport, Inc. in California Dedicated Contract Services and Intermodal Services drivers' class action. Deposition, December 10, 2013.

The Apple iPod iTunes Antitrust Litigation in the United States District Court for the Northern District of California Oakland Division, No. C 05 00037 YRG, C 06 04457 YRG. Expert on behalf of Apple in iPod antitrust class action. Supplemental Expert Report of Kevin M. Murphy and Robert H. Topel, December 20, 2013.

The Education Management Corp. Shareholder Derivate Action in the Court of Common Pleas of Allegheny County, Pennsylvania, Civil Division, No. GD-12-008785. Expert on behalf of Education Management Corp. in a Fraudulent Job Placement Claim and Incentive-Based Compensation Claim. Rebuttal Expert Report, January 8, 2014.

The Apple iPod iTunes Antitrust Litigation in the Unites States District Court for the Northern District of California Oakland Division, No. C 05 00037 YRG, C 06 04457 YRG. Expert on behalf of Apple in iPod antitrust class action. Deposition, January 8, 2014.

Philip Petrone, et al v. Werner Enterprises, Inc. and Drivers Management, LLC, United States District Court, District of Nebraska, Case No: 8:12-cv-307. Expert on behalf of Werner Enterprises in a class action wage and hour case. Expert Report, March 31, 2014.

Pro-Sys Consultants LTD. and Neil Godfrey v. Microsoft Corporation and Microsoft Canada Co./Microsoft Canada CIE, In The Supreme Court of British Columbia Vancouver Registry, No. L043175. Expert on behalf of Microsoft Corporation and Microsoft Canada Co./Microsoft Canada CIE in an antitrust class action case. Expert Report, April 9, 2014. Expert Report, November 2, 2017.

Philip Petrone, et al v. Werner Enterprises, Inc. and Drivers Management, LLC, United States District Court, District of Nebraska, Case No: 8:12-cv-307. Expert on behalf of Werner Enterprises in a class action wage and hour case. Expert Report, December 5, 2014.

The Apple iPod iTunes Antitrust Litigation in the Unites States District Court for the Northern District of California Oakland Division, No. C 05 00037 YRG, C 06 04457 YRG. Expert on behalf of Apple in iPod antitrust class action. Testimony, December 11, 2014.

Philip Petrone, et al v. Werner Enterprises, Inc. and Drivers Management, LLC, United States District Court, District of Nebraska, Case No: 8:12-cv-307. Expert on behalf of Werner Enterprises in a class action wage and hour case. Deposition, February 27, 2015.

The Dow Chemical Company v. Industrial Polymers, Inc., Quabaug Corporation, and Seegott Holdings, Inc., et al., On Petition for Writ of Certiorari to the United States Court of Appeals for the Tenth Circuit, The Supreme Court of the United States. No. 14-1091. Brief, April 9, 2015.

Kleen Products LLC, et al. v. International Paper, et al., United States District Court for the Northern District of Illinois Eastern Division, Case No. 1:10-cv-05711. Expert on behalf of Rock-Tenn CP, LLC in a containerboard antitrust class action case. Expert Report, June 8, 2015. Amended Expert Report, August 28, 2015. Deposition, October 1, 2015. Second Amended Expert Report, April 11, 2016.

Yassine Baouch, et al v. Werner Enterprises, Inc. and Drivers Management, LLC, United States District Court, District of Nebraska, Civil Action No: 12-408. Expert on behalf of Werner Enterprises in a class action wage and hour case. Expert Report, September 24, 2015.

Kirk Wilkerson, et.al. v. Carolyn W. Colvin, Acting Commissioner, Social Security Administration, EEOC Case No. 531-2008-00034X. Expert on behalf of the Social Security Administration in a class action discrimination case. Expert Report, September 25, 2015. Supplemental Expert Report, October 6, 2015.

Dr. Miles Snowden v. UnitedHealth Group, Inc., Before the American Arbitration Association, AAA Case No. 01-15-0003-3853. Expert on behalf of UnitedHealth Group, Inc. in an arbitration case. Rebuttal Expert Report, January 22, 2016.

Stacy Lucas, Tarek Albaba, David Gamma, Sarah Fisher et al. v. Breg, Inc., Gary Losse, Mark Howard et al., United States District Court for the Southern District of California, Case No. 3:15-CV-02258,BAS-NLS. Expert on behalf of Breg, Inc. in a false advertising case. Expert Report and Declaration, March 21, 2016.

Wal-Mart Stores, Inc. Wage and Hour Litigations in the United States District Court for the Northern District of California, N. 3:08-cv-05221 SI. Expert on behalf of Wal-Mart Stores, Inc in California truck driver class action. Expert Report, May 13, 2016. Deposition, June 29, 2016.

Quinton Brown, et al. v. Nucor Corporation and Nucor Steel Berkeley in the United States District Court for the District of South Carolina, Charleston Division, No: 2:04-22055-CWH. Expert Report, April 14, 2017.

Nancy Lykkehoy v. General Mills, Inc., Before the American Arbitration Association, AAA Case No. 01-17-0001-8445. Expert on behalf of General Mills, Inc. in an arbitration case. Expert Report, August 21, 2017.

Nancy Lykkehoy v. General Mills, Inc., Before the American Arbitration Association, AAA Case No. 01-17-0001-8445. Expert on behalf of General Mills, Inc. in an arbitration case. Testimony, September 29, 2017.

David Kirk v. General Mills, Inc., Before the American Arbitration Association, AAA Case No. 01-17-0002-4460. Expert on behalf of General Mills, Inc. in an arbitration case. Expert Report, October 9, 2017.

Michael Allard v. General Mills, Inc., Before the American Arbitration Association, AAA Case No. 01-17-0003-0905. Expert on behalf of General Mills, Inc. in an arbitration case. Expert Report, October 22, 2017.

Cung Le, et al. v. Zuffa, LLC d/b/a Ultimate Fighting Championship and UFC, United States District Court for the District of Nevada, Case No: 2:15-cv-01045-RFB-PAL. Expert on behalf of Zuffa, LLC. Expert Report, October 27, 2017.

Michael Murray v. General Mills, Inc., Before the American Arbitration Association, AAA Case No. 01-17-0003-2050. Expert on behalf of General Mills, Inc. in an arbitration case. Expert Report, January 5, 2018.

James Heflin v. General Mills, Inc., Before the American Arbitration Association, AAA Case No. 01-17-0004-0321. Expert on behalf of General Mills, Inc. in an arbitration case. Expert Report, February 26, 2018.

Denise Holtz v. General Mills, Inc., Before the American Arbitration Association, AAA Case No. 01-17-0003-0928. Expert on behalf of General Mills, Inc. in an arbitration case. Expert Report, March 21, 2018.

Denise Holtz v. General Mills, Inc., Before the American Arbitration Association, AAA Case No. 01-17-0003-0928. Expert on behalf of General Mills, Inc. in an arbitration case. Testimony, April 22, 2018.

Peggy Maxe v. General Mills, Inc., Before the American Arbitration Association, AAA Case No. 01-17-0005-2225. Expert on behalf of General Mills, Inc. in an arbitration case. Expert Report, April 23, 2018.

Highly Confidential Under Protective Order

APPENDIX B: MATERIALS RELIED UPON

Reports and Declarations

- Expert Report of Professor Robert H. Topel, *Cung Le, et al., v. Zuffa, LLC d/b/a Ultimate Fighting Championship and UFC*, Case No. 2:15-cv-01045-RFB-PAL (D. Nev.) (October 27, 2017)
- Sur-Rebuttal Expert Report of Professor Robert H. Topel, *Cung Le, et al., v. Zuffa, LLC d/b/a Ultimate Fighting Championship and UFC*, Case No. 2:15-cv-01045-RFB-PAL (D. Nev.) (February 12, 2018)
- Expert Report of Hal J. Singer, Ph.D., *Cung Le, et al., v. Zuffa, LLC d/b/a Ultimate Fighting Championship and UFC*, Case No. 2:15-cv-01045-RFB-PAL (D. Nev.) (August 31, 2017)
- Rebuttal Expert Report of Hal J. Singer, Ph.D., *Cung Le, et al., v. Zuffa, LLC d/b/a Ultimate Fighting Championship and UFC*, Case No. 2:15-cv-01045-RFB-PAL (D. Nev.) (January 12, 2018)
- Supplemental Expert Report of Hal J. Singer, Ph.D., *Cung Le, et al., v. Zuffa, LLC d/b/a Ultimate Fighting Championship and UFC*, Case No. 2:15-cv-01045-RFB-PAL (D. Nev.) (April 3, 2018)

Other Case Materials

- Singer Backup
- Singer Rebuttal Backup
- Singer Supplemental Backup

Books

- Federal Judicial Center. *Reference Manual on Scientific Evidence*. Washington, D.C.: The National Academies Press (3d ed. 2011)

Exhibit 1: Zuffa Per-Event Costs

	Singer Promotional Costs	Event Promotional Costs	Event Production Costs	Other Event Costs	Total Non-Fighter Event Costs
2008	\$684,182	\$614,358	\$1,817,173	\$694,789	\$3,126,320
2009	\$833,238	\$651,786	\$1,842,471	\$745,671	\$3,239,928
2010	\$1,067,276	\$837,187	\$1,875,276	\$811,427	\$3,523,889
2011	\$813,061	\$621,714	\$1,563,525	\$810,146	\$2,995,385
2012	\$1,302,717	\$1,061,282	\$2,639,942	\$1,001,358	\$4,702,582
2013	\$1,704,684	\$1,329,556	\$2,381,064	\$1,114,752	\$4,825,372
2014	\$1,331,081	\$799,334	\$2,287,983	\$944,681	\$4,031,998
2015	\$2,133,324	\$1,294,492	\$2,290,889	\$1,101,584	\$4,686,965
2016	\$1,103,507	\$1,046,824	\$1,786,527	\$1,879,393	\$4,712,744

Notes:

- [1] Costs are in 2016 dollars, deflated using the CPI-U.
- [2] The Singer Promotional Expenses include all Zuffa and Strikeforce expenses classified as promotional expenses by Dr. Singer. This includes expenses unrelated to PPV, Televised and Live Events.
- [3] Zuffa P&Ls are organized differently in 2008-2013 than in 2014-2015 and in 2016.
- [4] Zuffa Event Promotional Costs include the following line items:
- [a] From the "PPV Expenses" and "Live/Tape Delay TV Expenses" sections of their 2008-2013 P&Ls: Ticket Advertising, Other Ad/Broadcast Costs, Broadcast Advertising, PPV Advertising, Promotional/Giveaways, Event Related Promotions, Closed Circuit Advertising and Branding.
- [b] From the "Content Expense" and "Live Events Expense" sections of their 2014-2015 P&Ls: any of the line items in 4[a], if applicable, as well as Fox Advertising Gross Up and Other/Digital
- [c] From the "Content Expense" and "Live Events Expense" sections of their 2016 P&Ls: any of the line items in 4[a]-[b], if applicable, as well as Commercial PPV Marketing, Commercial PPV-COOP Marketing, COOP Marketing, Digital Marketing, Event Branding, Event Promos, International Brand Marketing, Other Branding, Outdoor Marketing, PPV Contractual Marketing, Print Marketing, Radio Marketing, Retail Marketing, Social Media Marketing, Television Marketing, Third Party Ticket Marketing, and Venue Ticket Marketing.
- [5] Zuffa Event Production costs include the following line items:
- [a] From the "PPV Expenses" and "Live/Tape Delay TV Expenses" sections of their 2008-2013 P&Ls: Graphics, Graphics, Posters, & Art, Set Design & Construction, Contract Production, Non-Contract Production, Equipment Rental, Video Production Costs, Announcers, and Signal Insurance.
- [b] From the "Content Expense" and "Live Events Expense" sections of their 2014-2015 P&Ls: any of the line items in 5[a], if applicable, as well as Production - Events.
- [c] From the "Content Expense" and "Live Events Expense" sections of their 2016 P&Ls: any of the line items in 5[a]-[b], if applicable, as well as Audio Production, Other Production Costs, Production Stats, and Ultimate Fighter Production.
- [6] Other Zuffa Event Costs include the following line items:
- [a] From the "PPV Expenses" and "Live/Tape Delay TV Expenses" sections of their 2008-2013 P&Ls: all line items except for those classified as Event Promotional Costs, Event Production Costs, and line items related to athlete compensation (Fighter Purse, Fighter Bonus, Fighter Sponsorship, LOA Payment, and Other Fighter Costs).
- [b] From the "Content Expense" and "Live Events Expense" sections of their 2014-2015 P&Ls: all line items except for those classified as Event Promotional Costs, Event Production Costs, and line items related to athlete compensation (any of the line items in 6[a], if applicable, as well as Fighter Comp, Referees, Medical, Athlete Bonus, Athlete Purse, and Athlete Purse-LOA). Also excludes line items not included in prior year "PPV Expenses" and "Live/Tape Delay TV Expenses" that do not appear to be event-related.
- [c] From the "Content Expense" and "Live Events Expense" sections of their 2016 P&Ls: all line items except for those classified as Event Promotional Costs, Event Production Costs, and line items related to athlete compensation (any of the line items in 6[a]-[b], if applicable, as well as Athlete Adjustments, Fighter Bonus-Disc, Fighter Bonus-FON, Fighter Bonus-PPV, Fighter Bonus-Signing, Fighter Purse-Show, and Fighter Purse-Win). Also excludes line items not included in prior year "PPV Expenses" and "Live/Tape Delay TV Expenses" that do not appear to be event-related.

Sources:

- [1] Zuffa Promotion Tables_CKD.xlsx (Singer Surrebuttal Backup)
- [2] Sherdog Denom for Market Shares.dta (Singer Backup)

Exhibit 2: Singer Impact Regressions, including Modified Singer Impact Regression with Event Costs on Right Hand Side

	Replicate Singer Original Regression (SR1, Table 6)			Singer Original Regression, Excluding Bouts Missing Event-Level Costs			Singer Original Regression, including all non-athlete compensation event costs ^[2]		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Foreclosure Share - Tracked	-0.033* [0.043]			-0.022 [0.233]			-0.019 [0.310]		
Foreclosure Share - Ranked		-0.043* [0.032]			-0.035 [0.086]			-0.030 [0.153]	
Foreclosure Share - Headliner			-0.032* [0.046]			-0.021 [0.250]			-0.019 [0.327]
Log (Event Costs - Event Fighter Comp)							-0.007** [0.000]	-0.007** [0.000]	-0.007** [0.000]
Constant	-0.131* [0.049]	-0.185* [0.021]	-0.133* [0.049]	-0.089 [0.142]	-0.145 [0.056]	-0.090 [0.146]	-0.033 [0.607]	-0.082 [0.316]	-0.034 [0.609]
Observations	7,154	7,154	7,154	7,067	7,067	7,067	7,067	7,067	7,067

Notes:

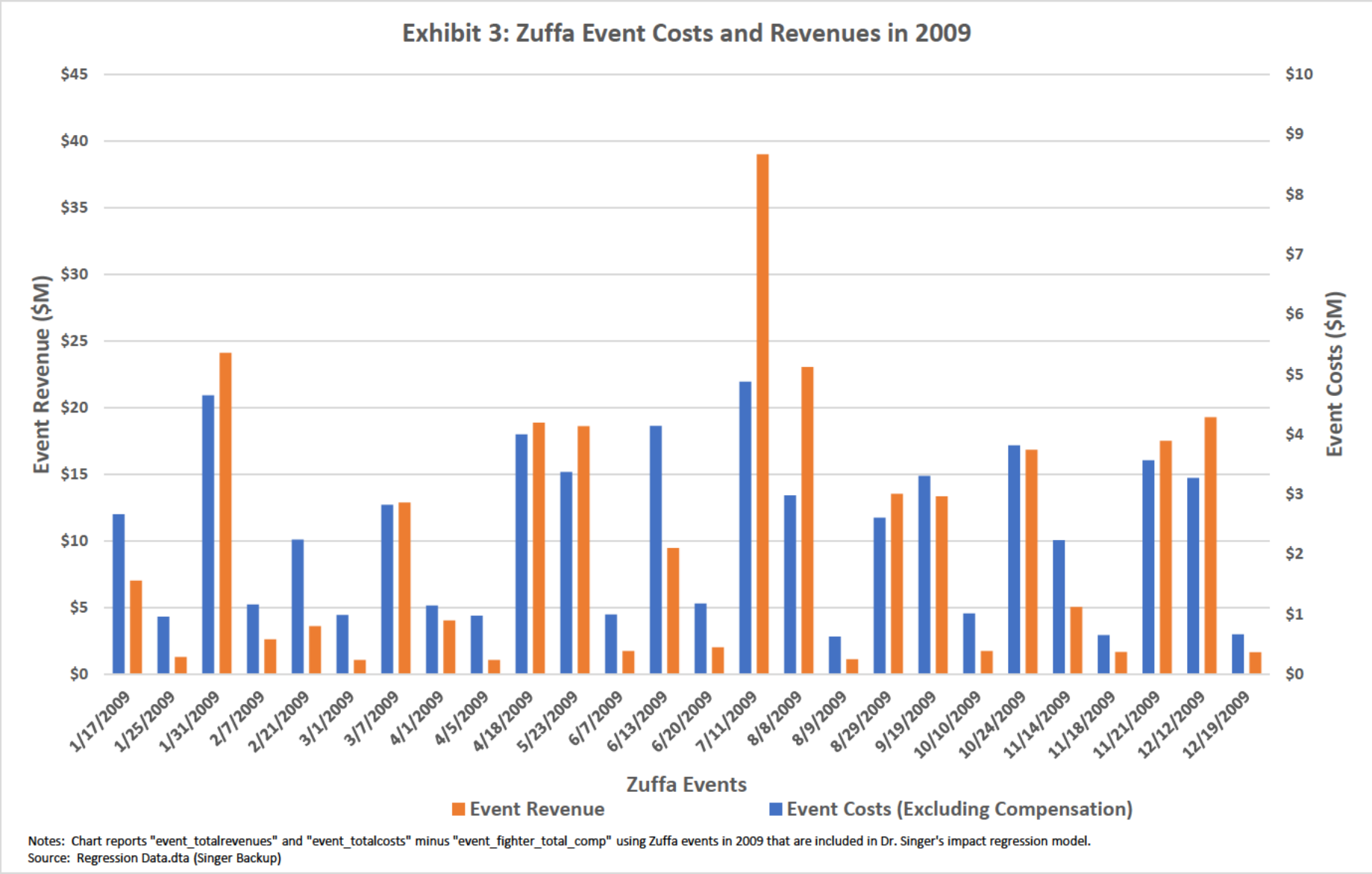
[1] Columns 1-3 replicate Table 6 of Dr. Singer's first report. Columns 4-6 exclude bouts that are missing information on event total costs. Columns 7-9 include logged (Event Costs - Athlete Compensation). This additional variable is calculated using Dr. Singer's "event_totalcosts" and "event_total_fighter_comp" fields.

[2] Columns 7-9 exclude bouts missing event-level cost information

[3] Robust p-values are in brackets. ** p<.01, *p<.05.

Source:

[1] Regression Data.dta (Singer Backup)



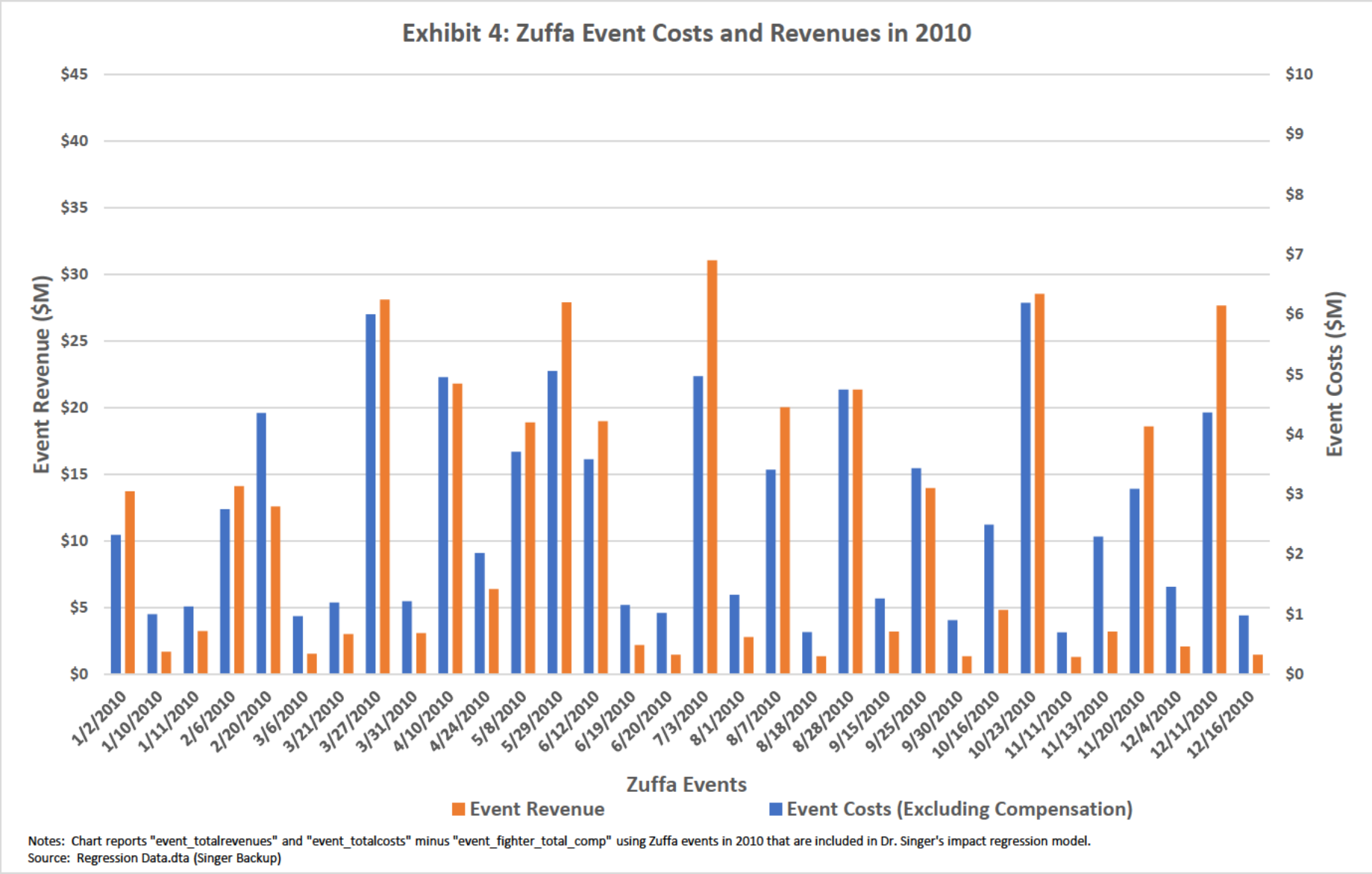


Exhibit 5: Zuffa Event Level Costs, Revenue, and Wage Share

Event Date	Event Name	Event Costs (Excluding Compensation)	Event Revenue	Event Athlete Compensation	Event Wage Share
03/21/10	UFC LIVE	\$1,191,054	\$2,992,794	\$983,500	32.9%
03/27/10	UFC 111	\$6,000,085	\$28,097,645	\$3,760,751	13.4%
03/31/10	UFC Fight Night 21	\$1,210,933	\$3,080,893	\$722,500	23.5%
07/07/16	UFN USA 2	\$1,595,901	\$3,048,611	\$1,912,750	62.7%
07/09/16	UFC 200	\$12,842,217	\$55,279,396	\$19,905,008	36.0%

Notes:

- [1] Event costs are calculated using Dr. Singer's "event_totalcosts" and "event_total_fighter_comp" variables.
[2] Event revenues are equal to Dr. Singer's "event_totalrevenues" variable.
[3] Wage share is equal to athletes' total compensation at an event ("event_total_fighter_comp") divided by event revenues ("event_totalrevenue")

Source:

- [1] Regression Data.dta (Singer Backup)